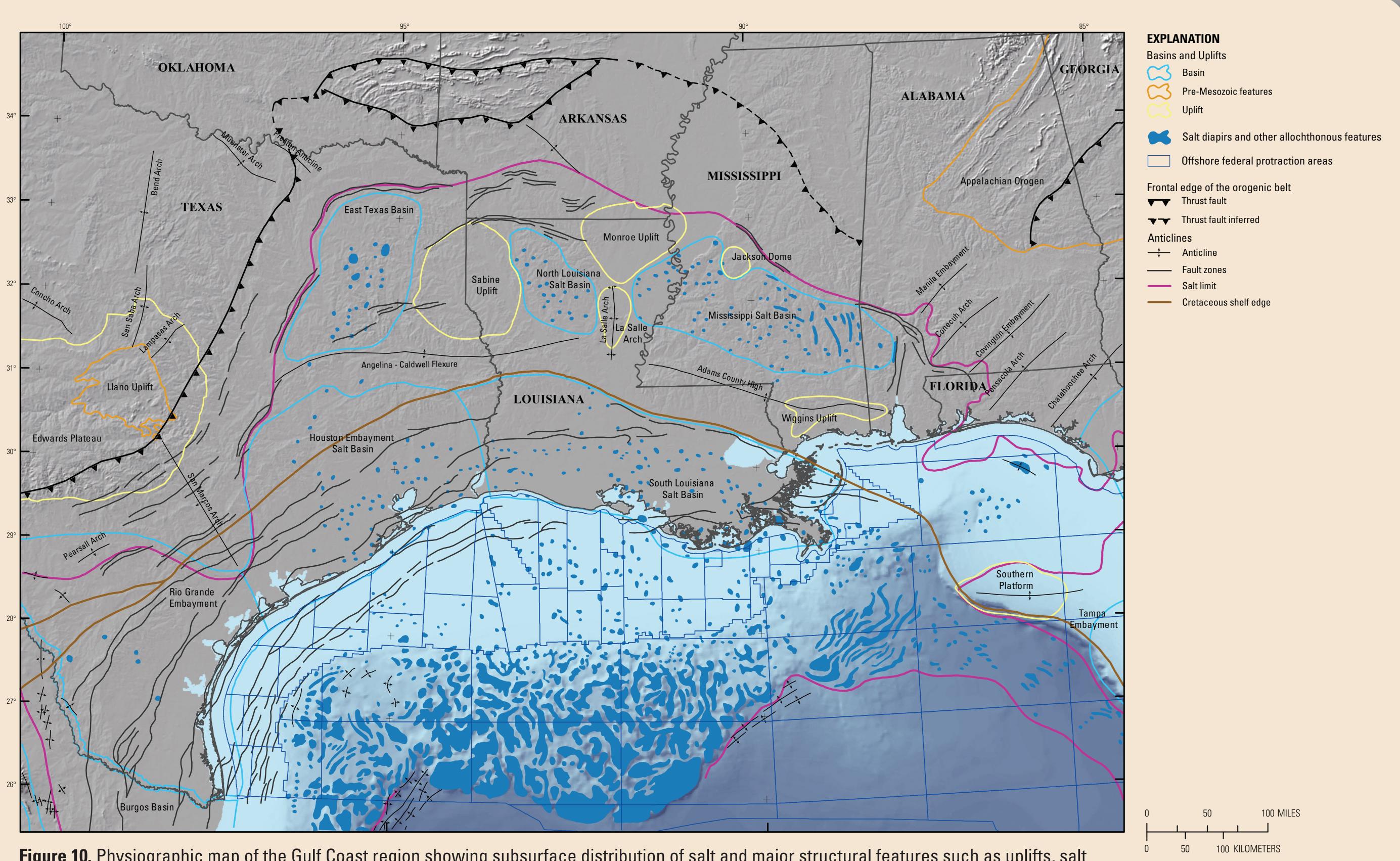
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| Figure 10. Physiographic map of the Gulf Coast region showing subsurface distribution of salt and major structural features such as uplifts, salt |
|---|
| basins, and fault zones. Data from U.S. Geological Survey (2012). |

| Pressure- | Total Number of | Number of Non- | Number of |
|--------------|-----------------|----------------|--------------|
| Gradient Map | Mud Weight | Interpolated | Interpolated |
| | Data Points | Data Points | Data Points |
| | | | |
| 0.60 psi/ft | 22,225 | 4,351 | 17,874 |
| 0.70 psi/ft | 10,654 | 1,739 | 8,915 |
| 0.80 psi/ft | 10,523 | 1,718 | 8,805 |
| 0.90 psi/ft | 9,976 | 2,003 | 7,973 |
| 1.00 psi/ft | 1,890 | 1,872 | 18 |
| Total | 55,268 | 11,683 | 43,585 |

Table 1. Data metrics for each pressure-gradient map.

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| Pressure- | Lower Bound | Upper Bound |
|--------------|-------------|-------------------------|
| Gradient Map | Pressure | Pressure |
| | Gradient | Gradient |
| | (psi/ft) | (psi/ft) |
| 0.60 psi/ft | 0.46 | 0.69 |
| 0.70 psi/ft | 0.61 | 0.79 |
| 0.80 psi/ft | 0.71 | 0.89 |
| 0.90 psi/ft | 0.81 | 0.99 |
| 1.00 psi/ft | 0.91 | Maximum good data value |

Table 2. Lower and upper bounds for the pressure-gradient range restrictions used in the linear interpolation algorithm.

5. RELEVANCE

- Identification and quantification of the occurrence, magnitude, location, and depth of overpressured, underpressured, and normally pressured regions
- Petroleum exploration
 - Comprehensive characterization of subsurface pressure system
 Regional pressure compartmentalization identification and quantification
 - Exploration of deep oil and gas resources based on their distinct pressure signatures
 Evaluation of reservoir-seal integrity based on its retention or leakage
 Evaluation of potential undiscovered hydrocarbon accumulations
 - Regional modeling of overpressure development
- Geologic interpretations (fig. 10)
- Anomalous geopressure areas from disequilibrium compaction due to clastic sediment loading over the Cretaceous shelf margins
- Rapid burial of sediments leading to onset of overpressure development
- Fracture gradients
- Inducing fractures due to exceeding the lithostatic fracture gradient of the rock
 Impact on well stimulation planning, enhanced recovery options, and hydraulic fracturing operations
- Impact on safety, well planning, economic decisions related to completing the well
 Science-based findings to support national policymakers' decisions about hydraulic fracturing and injection/sequestration of fluids
- Well planning
- Quantitative estimations of subsurface geopressure for well control
- Estimation of drilling mud weights by successive depths
- Pore-pressure prediction for well site safety
- Identification of hard overpressure areas for deviated and horizontal drilling of
- wellbores
- Locations of overpressured zones
- Mitigation of geopressure-related hazards
- Shallow geopressure hazard avoidance
- Identification and quantification of deep pockets of hard overpressure
- Locations of underpressured zones
- Potential targets for carbon dioxide injection and long-term containment
- Petroleum production may need formation pressure maintenance, such as fluid injection as hydrocarbons are extracted
- Economic impact of field development, well planning, and water flood infrastructure requirements
- Locations of normally pressured zones
- Implications for economics related to field development
- Evaluate dominant hydrocarbon production drive mechanisms and the necessity for alternative drive mechanisms and enhanced recovery methods
- Geopressured-geothermal resource identification
- Land usage
- Estimate subsurface geopressure by state, county, region
 Allocation of subsurface geopressure by onshore State lands, State waters, Federal lands, private lands, tribal lands, Bureau of Land Management lands and wilderness, National Park Service lands and wilderness, U.S. Forest Service lands, U.S. Fish and Wildlife lands, Department of Defense lands, etc.
- Free and unlimited dissemination of results
- Free and unlimited access to these research findings
- Made widely available to the general public, academia, media, other State and Federal governmental agencies, petroleum service and production industry, environmental industry, natural resources industry, domestic and foreign agencies
- National policy, and national and international relevance
- Science-based findings support national policymakers' decisions
- This study develops the foundation and methods that can be adapted to any location
- Hydrocarbon-bearing or otherwiseDomestic and worldwide application

6. SUMMARY

This regional mapping project presents a modern characterization of subsurface pressure gradients in the Gulf of Mexico basin, which is one of the most important petroleum-producing provinces in the United States. These isopressure-gradient maps enable the identification and quantification of the general occurrence, magnitude, location, and depth of anomalously overpressured and underpressured regions, as well as zones of normal pressure. These maps provide insight into potential issues related to oil and gas production as well as potential overpressured geohazards in shallow and deeper subsurface regions, which is critical for the safety and mitigation of pressure-related geohazards associated with new and ongoing exploration and development of the Nation's petroleum energy resources. In addition, these isopressure-gradient maps also enable the identification and quantification of anomalously overpressured regions, which are necessary for the exploration of deep oil and gas resources based on their distinctive pressure signatures. Regional subsurface pressure-gradient characterization is essential for the evaluation of reservoir-seal integrity and for the evaluation of potential undiscovered hydrocarbon accumulations. Identification of overpressured or underpressured regions is also a critical parameter for evaluating the feasibility of geologic sequestration and long-term containment of fluids, such as supercritical carbon dioxide for alternative disposal methods of greenhouse gases.

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8. NON-ENDORSEMENTS

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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